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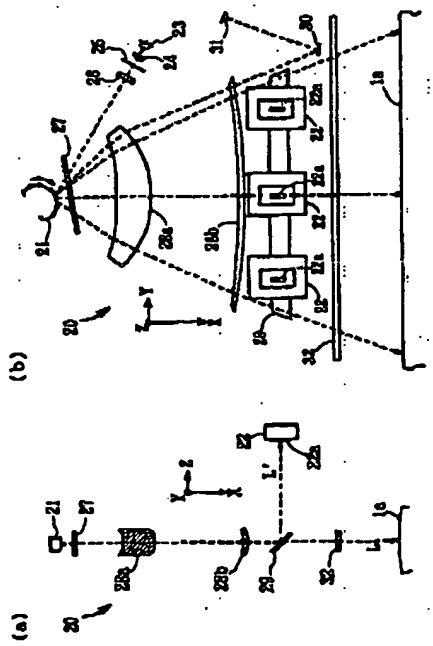
(54)【発明の名称】　画像形成装置

(57)【要約】
【課題】　書込手段の走査線曲がりを測定し、色味の違いや色ずれを補正可能なカラー画像形成装置を提供する。
【解決手段】　複数の感光体と、該感光体の各々へ独立してレーザ走査を行う複数の書込手段２０とを有し、上記各書込手段２０の走査により形成された各感光体上の静電潜像を各色の顕像に現像した後、該各色の顕像を転写材上に順次重ね転写する画像形成装置において、上記各書込手段２０で走査される光束をハーフミラー２９により分割し、分割した一方の光束Ｌ′を各ＣＣＤセンサ２２へ導くことによって各像高での副走査方向Ｚの走査位置を相対的に測定するとともに、上記ハーフミラーの手前に平行屈折面を回動自在に備えることにより走査線曲がりを補正可能な制御手段を備えた構成である。



1

【特許請求の範囲】

【請求項１】　複数の回転自在な感光体と、回転する感光体の各々へ独立してレーザ走査を行う複数の書込手段とを有し、該書込手段は少なくとも、光源と、該光源からのレーザ光束を主走査方向に偏向する光偏向手段と、偏向するレーザ光束を感光体面に結像する走査用レンズとからなり、上記各々の書込手段のレーザ走査により形成された各感光体上の静電潜像を対応する各色の顕像に現像した後、該各色の顕像を転写材上に重ね合わせて転写する画像形成装置において、

上記各書込手段で走査されるレーザ光束をＣＣＤセンサへ導くことによって、各書込手段の走査線曲がりを測定する測定手段を備えたことを特徴とする画像形成装置。

【請求項２】　上記測定手段が、上記光偏向手段で偏向されるレーザ光束を、感光体面に入射する第１の光束と、上記ＣＣＤセンサに入射する第２の光束とに分割する光束分離手段を有することを特徴とする請求項１記載の画像形成装置。

【請求項３】　上記光束分離手段が、上記光偏向手段と感光体面との間に設けられたハーフミラーであることを特徴とする請求項２記載の画像形成装置。

【請求項４】　上記第１の光束が主走査方向に偏向されたときの第２の光束の移動軌跡上に沿って複数のＣＣＤセンサを配置したことを特徴とする請求項２又は３記載の画像形成装置。

【請求項５】　各書込手段に対して少なくとも１つのＣＣＤセンサが配置され、該ＣＣＤセンサを上記第２の光束の移動軌跡上に沿って移動させる移動手段を備えたことを特徴とする請求項２又は３記載の画像形成装置。

【請求項６】　上記ＣＣＤセンサが、上記第２の光束の光軸と略垂直な平面内にある画素列の並び方向が上記第２の光束の移動軌跡と交わり且つ直交しないように設置されたことを特徴とする請求項２から５のいずれかに記載の画像形成装置。

【請求項７】　さらに、上記走査線の曲がりを補正する補正手段を備えたことを特徴とする請求項１から６のいずれかに記載の画像形成装置。

【請求項８】　上記補正手段は、上記光偏向手段で偏向されたレーザ光束の光軸を副走査方向へ微細移動させ、該レーザ光束の感光体へ結像する走査線の曲がり量を調整可能としたものであることを特徴とする請求項７記載の画像形成装置。

【請求項９】　上記補正手段は、上記光偏向手段と上記走査用レンズとの間へ設置され透過するレーザ光束を副走査方向に沿って曲げる屈折面を備えた透明部材を有し、該透明部材を傾けることにより走査線の曲がり量を調節するものであることを特徴とする請求項８記載の画像形成装置。

【発明の詳細な説明】

【０００１】

2

【発明の属する技術分野】本発明は、レーザプリンタ、デジタルＰＰＣ等の電子写真式の画像形成装置に関し、特に複数組の書込手段（光学走査系）及び被書込手段（感光体）を有し、各被書込手段に形成された像を重ね合わせて画像を形成する画像形成装置に関する。

【０００２】

【従来の技術】レーザプリンタ等の画像形成装置には、駆動機構により回転駆動される複数の感光体に対して独立して複数の書込手段により複数の異なった色の情報をそれぞれ走査線で書き込んで静電潜像を形成し、これらの静電潜像を複数の顕像化手段により異なった色の顕像にそれぞれ顕像化して転写材上に重ね合わせて転写しカラー画像を得るデジタルカラー複写機などの画像形成装置がある。上記書込手段の各々は、読み出される各色の画像情報信号に応じて駆動制御される半導体レーザ等からレーザ光束を出射する。レーザ光束は、多面鏡、レンズ等の光学部品を介して一様に帯電された感光体面に集光されるとともに像高方向に走査される。そして回転する感光体面には、所定ピッチの走査線として画像情報が書き込まれ、静電潜像が形成される。

【０００３】従来、上記のように複数の書込手段としてのレーザビーム走査装置を備えたカラー画像形成装置では、それぞれの書込手段において温度変化などを原因として走査装置内のレンズや光源位置にずれが発生することがある。このように内のレンズや光源位置がずれると、被走査面上のレーザスポットの移動軌跡、すなわち走査線の曲がりが変化してしまう。レーザ光束の走査線の曲がりが各色の書込手段で異なれば、異なる色の画像間隔のずれ、あるいは重なりにより色味の違いや色ずれが起りカラー画像の品質が低下する不具合があった。

【０００４】この種の不具合を防止するために、上記走査線の曲がりの測定方法としては、例えば特開平９－９０６９５号に記載されるように、複数組みの発光素子及び受光素子からなる反射型フォトセンサを転写ベルトに向けて配列し、転写ベルト上の顕像を受光素子で捕らえ、顕像のずれを測定するといった方法が公知である。

【０００５】

【発明が解決しようとする課題】しかし、上記特開平９－９０６９５号記載の測定方法では、顕像を照らす光源が必要となること、また４色の顕像を区別して捕らえるために各色対応の受光素子が必要になり、装置がコスト高となる。

【０００６】そこで、本発明は、各書込手段におけるレーザ光束の走査線曲がりの変化を測定するための安価な手段を備え、さらに走査線曲がりの変化による色味の違いや色ずれを補正可能な画像形成装置を提供することを目的としている。

【０００７】

【課題を解決するための手段】上記目的を達成する本発明の画像形成装置は、複数の回転自在な感光体と、回転

する感光体の各々へ独立してレーザ走査を行う複数の書込手段とを有し、該書込手段は少なくとも、光源と、該光源からのレーザ光束を主走査方向に偏向する光偏向手段と、偏向するレーザ光束を感光体面に結像する走査用レンズとからなり、上記各々の書込手段のレーザ走査により形成された各感光体上の静電潜像を対応する各色の顕像に現像した後、該各色の顕像を転写材上に重ね合わせて転写する画像形成装置において、上記各書込手段で走査されるレーザ光束をＣＣＤセンサへ導くことによって、各書込手段の走査線曲がりを測定する測定手段を備えたを特徴としている。

【０００８】上記測定手段が、上記光偏向手段で偏向されるレーザ光束を、感光体面に入射する第１の光束と、上記ＣＣＤセンサに入射する第２の光束とに分割する光束分離手段を有する構成とすることができる。この場合、上記光束分離手段が、上記光偏向手段と感光体面との間にハーフミラーを設ける構成にすることができる。

【０００９】上記第１の光束が主走査方向に偏向されたときの第２の光束の移動軌跡上に沿って複数のＣＣＤセンサを配置した構成とすることができる。または、各書込手段に対して少なくとも１つのＣＣＤセンサが配置され、該ＣＣＤセンサを第２の光束の移動軌跡上に沿って移動させる移動手段を備えた構成としてもよい。またこの場合に、各ＣＣＤセンサが、上記第２の光束の光軸と略垂直な平面内にある画素列の並び方向が第２の光束の移動軌跡と交わり且つ直交しないように設置された構成にするよい。

【００１０】さらに、上記走査線の曲がりを補正する補正手段を備えた構成にすることができる。この場合、該補正手段は、上記光偏向手段で偏向されたレーザ光束の光軸を副走査方向へ微細移動させ、該レーザ光束の感光体へ結像する走査線の曲がり量を調整可能とした構成とすることができる。またこの場合、上記補正手段は、上記光偏向手段と上記走査用レンズとの間へ設置され透過するレーザ光束を副走査方向に沿って曲げる屈折面を備えた透明部材を有し、該透明部材を傾けることにより走査線の曲がり量を調節する構成にすることができる。

【００１１】

【発明の実施の形態】以下、図面に基づいて本発明の一実施例を説明する。図１は、本実施例の画像形成装置の概略構成図である。この画像形成装置内は、画像読取部４０と、画像処理部５０と、プリンタ部６０とからなり、プリンタ部６０には書込手段２０と、ドラム状の感光体１と、この感光体１廻りの作像部品とにより構成された作像装置が転写ベルト２上に４組並ぶように配置されている。これら複数の作像装置は、図１中右手から順にブラック（以下「ＢＫ」で示す）、シアン（以下「Ｃ」で示す）、マゼンタ（以下「Ｍ」で示す）、イエロー（以下「Ｙ」で示す）の各色作像工程を分担する。ここでは、まず本装置の構成及び一連の作像動作を概説する。

【００１２】各作像装置では、それぞれがＢＫ、Ｃ、Ｍ、Ｙの４色の顕像を形成し、順次形成される各色の顕像を転写材へ重ね転写することでフルカラー画像を得るようになっている。このため転写ベルト２は、駆動ローラ２ａ及び従動ローラ２ｂ，２ｃに張架されて図示しない駆動源により駆動ローラ２ａを介して回転駆動され、レジストローラ３から送られた転写材を搬送する。なお、この実施例では、ＢＫ、Ｃ、Ｍ、Ｙの４色の顕像を重ね合わせる構成であるが、これら４組の記録装置のうち、１組の記録装置を省略して３色の顕像を重ね合わせてカラー画像を得るようにしてもよい。

【００１３】例えば、Ｃ顕像を形成する記録装置では、感光体１Ｃは、図示しない駆動機構により図１中の時計方向（書込手段２０Ｃから見れば副走査方向である）へ回転駆動されて帯電チャージャ４Ｃからなる帯電手段により均一に帯電され、書込手段２０Ｃによる露光で静電潜像が形成される。ここに、書込手段２０Ｃは、画像処理部５０からのＣのデジタル画像信号によりレーザ駆動制御部で光源を駆動制御してＣのデジタル画像信号により強度変調されたレーザビームを出射させ、このレーザ光束をポリゴンミラー２１からなる光偏向手段で主走査方向（感光体１の軸方向）へ繰り返し偏向し、感光体１Ｃに走査線としてＣの情報を書き込み静電潜像を形成する。また、上記Ｃの潜像形成と同様に、他の記録装置では、それぞれ感光体１ＢＫ，４Ｍ，４Ｙが回転駆動され、各々の帯電チャージャ４ＢＫ，４Ｍ，４Ｙにより均一に帯電され、書込手段２０ＢＫが感光体１ＢＫに対し、書込手段２０Ｍが感光体１Ｍに対し、書込手段２０Ｙが感光体１Ｙに対し、各々の色の画像情報に応じた露光によって静電潜像が書き込まれる。

【００１４】また、上記書込手段２０ＢＫ～２０Ｙのレーザビームを測定する手段の概略は、次のようである。上記各々の書込手段２０ＢＫ～２０Ｙの側には、それぞれに、ＣＣＤセンサからなるＣＣＤユニット２２ＢＫ、２２Ｃ，２２Ｍ，２２Ｙが配置されている。そして感光体１へ向かうレーザ光束の一部が各書込手段２０ＢＫ～２０Ｙ内から、各々のＣＣＤユニット２２ＢＫ～２２Ｙへ導かれる。これら各書込手段２０と、各ＣＣＤセンサ２２とはＣＰＵ等の演算装置で構成される制御部５１に接続されている。

【００１５】潜像形成のつぎに、感光体１Ｃ上の静電潜像は、顕像化手段としての現像装置５ＣによりＣトナーからなる１成分現像剤もしくはＣトナーとキャリアからなる２成分現像剤により現像されてＣの顕像となる。このＣ顕像の形成と同様に、感光体１ＢＫ，１Ｍ，１Ｙ上の静電潜像は、各々、現像装置５ＢＫ，５Ｍ，５Ｙによりトナー、Ｍトナー、Ｙトナーを含む現像剤でそれぞれ現像され、ＢＫ、Ｍ、Ｙの顕像となる。

【００１６】上記画像形成動作に伴って、例えば２つの

給紙カセット６の何れかから給紙コロ７により転写紙Ｐからなる転写材がレジストローラ３へ給紙される。レジストローラ３は転写紙Ｐを各感光体１上の画像形成とのタイミングを取るようにして転写ベルト２へ送出し、転写ベルト２は転写紙Ｐを熱定着ローラ９方向へ搬送する。転写ベルト２上の転写紙Ｐは、転写ベルト２と感光体１ＢＫ，１Ｃ，１Ｍ，１Ｙとのニップ部を通過する際に、転写チャージャ８ＢＫ，８Ｃ，８Ｍ，８Ｙにより、順次に、感光体１ＢＫ上のＢＫ顕像、感光体１Ｃ上のＣ顕像、感光体１Ｍ上のＭ顕像、感光体１Ｙ上のＹ顕像が転写され、印字面にフルカラー画像が形成される。その後、転写紙Ｐは、熱定着ローラ９によりトナーが定着されて排紙ローラ１０により外部へカラーコピーとして排出される。

【００１７】また、感光体１ＢＫ，１Ｃ，１Ｍ，１Ｙはそれぞれ、顕像転写後にクリーニング装置１１ＢＫ，１１Ｃ，１１Ｍ，１１Ｙによりクリーニングされて残留トナーが除去される。また、クリーニング装置１２は転写ベルト２を転写紙搬送後にクリーニングする。

【００１８】以下、上記画像形成装置のレーザ走査位置の測定手段、及びレーザ走査位置の補正手段について詳細に説明する。

【００１９】図２は、図１の書込手段２０周辺の構成を示す図で、同図（ａ）は側断面図、同図（ｂ）は平面図である。これらの図に示すように、半導体レーザ２３からなる光源から発せられたレーザ光束はコリメートレンズ２４、アパーチャ２５、シリンドリカルレンズ２６、防音ガラス２７を経て、図示しないモータで回転駆動されるポリゴンミラー２１に逆し偏向される。偏向されたレーザ光束は再び防音ガラス２７を通り、走査用レンズ２８ａ，２８ｂを経て、光束分離手段であるハーフミラー２９へ達する。

【００２０】図２（ａ）に示すように、ハーフミラー２９に達したレーザ光束のうち、ハーフミラー２９を透過した第１の光束Ｌは、防塵ガラス３２を経て被走査面である感光体面１ａに結像し走査線を書き込み、一方ではハーフミラー２９で反射した第２の光束Ｌ’がＣＣＤユニット２２に入射する。

【００２１】図２（ｂ）に示すように、主走査方向Ｙ（像高方向）に所定間隔を開けて３つのＣＣＤユニット２２が設置されている。すなわち、これらのＣＣＤユニット２２は、ポリゴンミラー２１により偏向される第１の光束Ｌの走査に伴う上記第２の光束Ｌ’の走査軌跡上に、受光部としてのラインＣＣＤ２２ａを並列するものである。ポリゴンミラー２１で偏向される第２の光束Ｌ’は、次々と３つのＣＣＤユニット２２へ入射し、これをポリゴンミラー２１の走査面毎に繰り返すこととなる。なお、第１の光束Ｌのうち、主走査方向Ｙの一端側へ振られた一部のレーザが折り返しミラー３０を経て、同期センサ３１に入射する。

【００２２】本実施例ではハーフミラー２９が主走査方向Ｙに沿って設けられ、ポリゴンミラー２１からの光束はほぼ直角に分割される。したがって、各ラインＣＣＤ２２ａはハーフミラー２９のすぐ横、すなわち副走査方向Ｚへ所定距離離間してレーザ光束Ｌ’に対し垂直に向けられ、且つ主走査方向Ｘに等間隔で並ぶように取り付けられている。

【００２３】また、各ラインＣＣＤ２２ａの画素列が、第２の光束Ｌ’の光軸に対し垂直な平面内にあって、この画素の並び方向が第１の光束Ｌの光軸に沿ったＸ方向に配置されている。すなわち、第１の光束Ｌが感光体面１ａに書き込む走査線の副走査位置は、第２の光束Ｌ’の結像するＸ方向の画素位置により相対的に特定される。したがって、ラインＣＣＤ２２ａ上のＸ方向の光量心を計れば、その像高における走査線の副走査位置を反映したものとなる。そして、走査領域内の３箇所に設けられたＣＣＤユニット２２の各出力は制御部５１に取り込まれ、各像高での副走査位置が特定され走査線の曲がりが測定される。

【００２４】また、上記のハーフミラー２９を用いた構成により、別途の光源を設けることなくレーザ光束を直接ラインＣＣＤ２２ａに導くことによって走査線の曲がりの測定が可能となり、また、各書込手段２０毎に顕像化前の工程で測定されるためにＣＣＤよりなる単色用の安価な受光素子で構わないのである。また、ＣＣＤセンサは、元々画素が等間隔で配列した状態で一体化されていることから、配置が容易でしかも感度についても電気的に光蓄積時間が変えられるので調整も容易である。

【００２５】なお、本実施例では、各書込手段２０に対して複数のＣＣＤユニット２２を用いているが、１つのＣＣＤユニット２２を図示しない移動ステージに取り付けて主走査方向Ｙに移動させ、所望の像高で光束Ｌ’が通過する画素位置を調べることによっても測定が可能である。この場合、必要なセンサの数が減りこの点でのコスト低減に有利である。

【００２６】また、本実施例では、ラインＣＣＤ２２ａの画素列方向が感光体面１ａでの走査位置ずれを特定可能なＸ方向に一致しＹ方向に直交しているが、この画素列方向はＸ方向と完全に一致させず、むしろＸＹ平面内にあってＸ方向と交わるがＹ方向に直交しないように傾けるとよい。こうすれば感光体面１ａにおける副走査方向Ｚ（ラインＣＣＤではＸ方向に現れる）に対する画素ピッチが狭まり画素間隔が細かくなったのと同じ効果が得られ、走査線曲がりの測定精度が向上するのである。

【００２７】図３は、走査線曲がりの補正手段を備えた書込手段２０の断面図である。ここでいう補正手段は、ハーフミラー２９へ達する前のレーザ光束を屈折させこの光軸位置を可変とした光軸移動手段を有し、この光軸移動手段を上記制御部５１にて駆動制御することにより走査用レンズ２８ａ，２８ｂに入射するレーザ光束の副

走査方向高さを変え、各書込手段２０間での走査線曲がり量を一致させる。

【００２８】本実施例における上記光軸移動手段は、走査用レンズ２８ａの手前に設けられた長方形断面の透明部材３１である。この透明部材３１は、長手方向が主走査方向Ｙに一致し、前面と後面とが略平行の平行屈折面３１ａを有するものである。透明部材３１はこの中心近傍を通る主走査方向Ｙを軸として回動自在であり、これにより平行屈折面３１ａは前面と後面とが共に光軸に対して所定の角度を持つようになっている。

【００２９】そして、上記ポリゴンミラー２１で偏向されたレーザ光束は、防音ガラス２７を経てから透明部材３１を通過し、このとき透明部材３１の回転角度により設定される前後の平行屈折面３１ａによりレーザ光軸の副走査方向Ｚが平行に移動される。副走査方向Ｚへ平行移動したレーザ光束は、走査用レンズ２８ａ，２８ｂを通って最終的に感光体面１ａ上では走査線曲がり量の変化となって現れる。

【００３０】一方、走査線の曲がり量は、上述したように上記ラインＣＣＤ２２ａの出力から制御部５１で求められ、ここで走査線位置の正規の値（理論値）あるいは各書込手段２０間での比較により、制御偏差量が得られる。これは透明部材３１に必要な操作量としての回転角度量に換算され、これによって透明部材３１が駆動制御される。このようにして、各ＣＣＤユニット２２で基準化される走査位置が各書込手段２０間で一致するように透明部材３１の回転角度を制御しこの前後２つの屈折面３１ａを介して、各走査線の曲がりを揃えることにより色ずれ等を補正し、画像の品質を向上させることができる。

【００３１】なお、上記平行平板等からなる透明部材３１は全像高をカバーする必要がある。本発明に関わる透明部材３１は、ポリゴンミラー２１と走査用レンズ２８ａとの間に設置されており、この点では走査用レンズ２８と感光体面１ａとの間に設置する場合と比較して像高方向に必要とされる透明部材３１の大きさが小さくて済み、その分コスト低減に有利である。

【００３２】

【発明の効果】以上説明したように、本発明の画像形成装置は、各書込手段で走査されるレーザ光束をＣＣＤセンサへ導くことによって、各書込手段の走査線曲がりを測定する測定手段を備えた構成なので、上記ＣＣＤセンサによって各書込手段ごとの走査線の曲がりを比較的安価且つ容易に測定でき、これにより各像を重ね転写して得られる画像の品質を劣化させないために、どの書込手段の走査線の曲がりをどの程度補正する必要があるかなどを知ることができる。

【００３３】上記測定手段が、上記光偏向手段で偏向されるレーザ光束を、感光体面に入射する第１の光束と、上記ＣＣＤセンサに入射する第２の光束とに分割する光束分離手段を有する構成によれば、該光束分離手段により、各書込手段は画像形成可能な状態のままで走査線の曲がりを測定できる。

【００３４】上記第１の光束が主走査方向に偏向されたときの第２の光束の移動軌跡上に沿って複数のＣＣＤセンサを配置した構成によれば、該複数のＣＣＤセンサを主走査方向に並べるので、可動部の少ない簡単な機構で走査線曲がりを測定できる。

【００３５】各書込手段に対して少なくとも１つのＣＣＤセンサが配置され、該ＣＣＤセンサを第２の光束の移動軌跡上に沿って移動させる移動手段を備えた構成によれば、各書込手段に必要なＣＣＤセンサが１つのみなので、これを複数設ける場合よりコストを低減できる。

【００３６】上記ＣＣＤセンサが、上記第２の光束の光軸と略垂直な平面内にある画素列の並び方向が第２の光束の移動軌跡と交わり且つ直交しないように設置された構成によれば、上記第２の光束の移動軌跡方向と直交する場合より、上記移動軌跡の副走査位置を特定する方向での画素列ピッチが狭まりラインＣＣＤの測定分解能が高くなるので測定精度が向上する。

【００３７】さらに、上記走査線の曲がりを補正する補正手段を備えた構成によれば、各書込手段で生じた走査線の曲がりを補正することにより重ね転写画像における色ずれ等の品質劣化を抑えられる。

【図面の簡単な説明】

【図１】本実施例の画像形成装置の概略構成を示す断面図である。

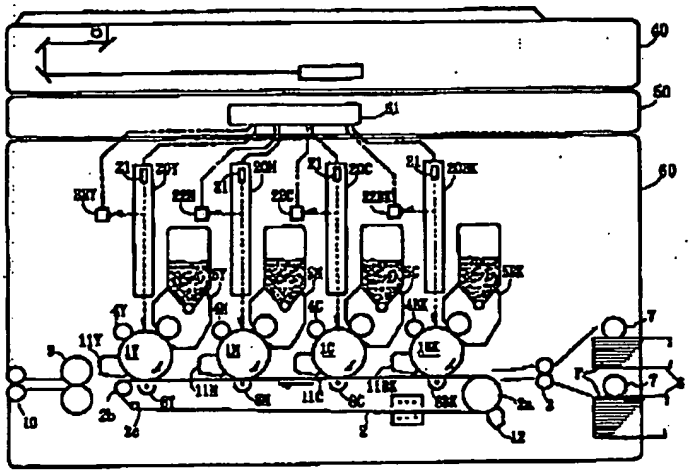
【図２】本実施例に関わる書込手段の構成を示す図で、（ａ）は断面図、（ｂ）は平面図である。

【図３】走査線曲がりの補正手段を備えた書込手段の断面図である。

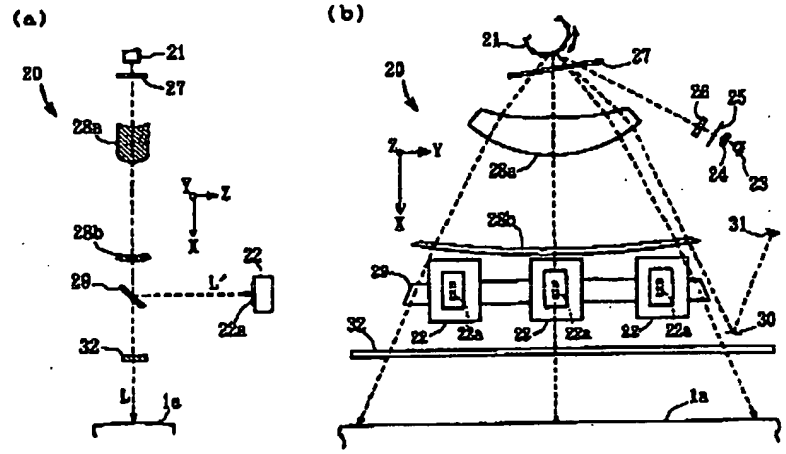
【符号の説明】

１	感光体
１ａ	感光体面
２０	書込手段
２１	ポリゴンミラー（光偏向手段）
２２ａ	ラインＣＣＤ（ＣＣＤセンサ）
２３	半導体レーザ（光源）
２８	走査用レンズ
２９	光束分離手段、ハーフミラー
３１	透明部材
３１ａ	透明部材の屈折面
Ｌ	第１の光束
Ｌ′	第２の光束
Ｐ	転写紙（転写材）
Ｙ	主走査方向
Ｚ	副走査方向

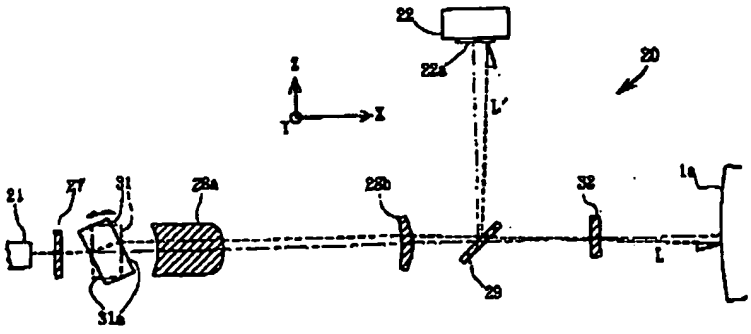
【図1】



【図2】



【図3】



PATENT ABSTRACTS OF JAPAN

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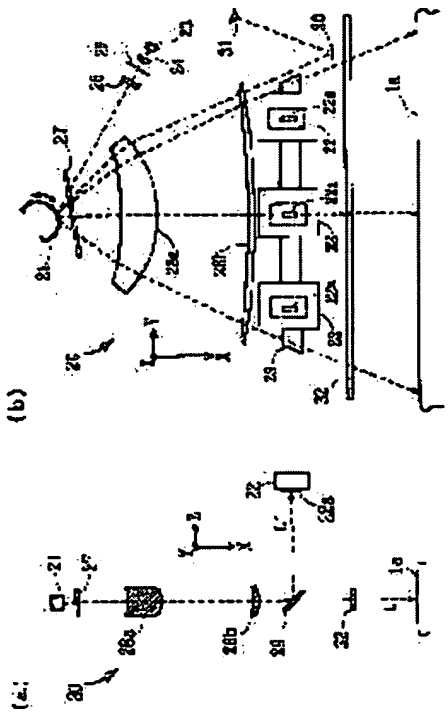
(72)Inventor : UEDA TAKESHI

(54) IMAGE FORMING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a color image forming device capable of correcting the difference of color or color slurring by measuring the bend of the scanning line of a write means.

SOLUTION: This image forming device is provided with plural photoreceptors and plural write means 20 independently performing laser scanning to the respective photoreceptors, and electrostatic latent images on the respective photoreceptors formed by the scanning of the write means 20 are developed to the developed images of respective colors, then the developed images of the respective colors are successively superposed and transferred to transfer material. The device is equipped with a control means by which a scanning position in a subscanning direction Z at each image height is relatively measured by dividing the luminous flux for scanning by the write means 20 by the use of a half mirror 29 and guiding either luminous flux L' of divided ones to a CCD sensor 22, and the bend of the scanning line is corrected by turnably providing a parallel refractive surface on the front side of a half mirror.



LEGAL STATUS

[Date of request for examination]

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CLAIMS

[Claim(s)]
[Claim 1] It has the photo conductor in which two or more revolutions are free, and two or more write-in means to perform a laser scan independently to each of the rotating photo conductor. At least this write-in means The light source, It consists of an optical deflection means to deflect the laser beam bundle from this light source to a main scanning direction, and a lens for a scan which carries out image formation of the laser beam bundle to deflect to a photo conductor side. In the image formation equipment which piles up and imprints **** of each of this color on imprint material after developing the electrostatic latent image on each photo conductor formed of the laser scan of the write-in means of each above to corresponding **** of each color Image formation equipment characterized by having a measurement means to measure the scanning-line deflection of each write-in means by leading the laser beam bundle scanned with each above-mentioned write-in means to a CCD sensor.
[Claim 2] Image formation equipment according to claim 1 with which the above-mentioned measurement means is characterized by having a flux of light separation means to divide the laser beam bundle deflected with the above-mentioned optical deflection means into the 1st flux of light which carries out incidence to a photo conductor side, and the 2nd flux of light which carries out incidence to the above-mentioned CCD sensor.
[Claim 3] Image formation equipment according to claim 2 characterized by the above-mentioned flux of light separation means being the half mirror prepared between the above-mentioned optical deflection means and the photo conductor side.
[Claim 4] Image formation equipment according to claim 2 or 3 characterized by having arranged two or more CCD sensors along the migration locus top of the 2nd flux of light when the 1st flux of light of the above is deflected by the main scanning direction.
[Claim 5] Image formation equipment according to claim 2 or 3 characterized by having the migration means to which at least one CCD sensor is arranged to each write-in means, and this CCD sensor is moved along the migration locus top of the 2nd flux of light of the above.
[Claim 6] the above-mentioned CCD sensor -- the optical axis of the 2nd flux of light of the above, and abbreviation -- image formation equipment given in either of claims 2-5 to which the direction of a list of the pixel train in a vertical flat surface is characterized by the migration locus of the 2nd flux of light of the above, the intersection, and being installed so that it may not intersect perpendicularly.
[Claim 7] Furthermore, image formation equipment given in either of claims 1-6 characterized by having an amendment means to amend the deflection of the above-mentioned scanning line.
[Claim 8] The above-mentioned amendment means is image formation equipment according to claim 7 characterized by enabling adjustment of the amount of deflection of the scanning line which is made to carry out detailed migration of the optical axis of the laser beam bundle deflected with the above-mentioned optical deflection means in the direction of vertical scanning, and carries out image formation to the photo conductor of this laser beam bundle.
[Claim 9] The above-mentioned amendment means is image formation equipment according to claim 8 characterized by being what adjusts the amount of deflection of the scanning line by having the transparence member equipped with the refracting interface which bends the laser beam bundle which it is installed between the above-mentioned optical deflection means and the above-mentioned lens for a scan, and is penetrated along the direction of vertical scanning, and leaning this transparence member.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Especially this invention relates to the image formation equipment which has two or more sets of write-in means (optical scan system), and a written in means (photo conductor), piles up the image formed in each ****** means about electrophotography-type image formation equipment, such as a laser beam printer and a digital plain paper copier, and forms an image.
[0002]
[Description of the Prior Art] The information on a color that plurality changed with two or more write-in means independently to two or more photo conductors by which revolution actuation is carried out with a drive is written in image formation equipments, such as a laser beam printer, with the scanning line, respectively, an electrostatic latent image is formed, and there are image formation equipments, such as a digital color copying machine which develops these electrostatic latent images to **** of the color which changed with two or more development means, respectively, piles up and imprints on imprint material, and obtains a color picture. Each of the above-mentioned write-in means carries out outgoing radiation of the laser beam bundle from the semiconductor laser by which actuation control is carried out according to the image information signal of each color by which reading appearance is carried out. A laser beam bundle is scanned in the direction of image quantity while being condensed by the photo conductor side uniformly charged through optics, such as a polygon mirror and a lens. And image information is written in the photo conductor side to rotate as the scanning line of a predetermined pitch, and an electrostatic latent image is formed in it.
[0003] Conventionally, with the color picture formation equipment equipped with the laser beam scanner as two or more write-in means as mentioned above, a gap may occur in the lens and light source location in a scanner by considering a temperature change etc. as a cause in each write-in means. Thus, if an inner lens and an inner light source location shift, the migration locus of the laser spot on a scan layer-ed, i.e., the deflection of the scanning line, will change. When the deflection of the scanning line of a laser beam bundle differed with the write-in means of each color, there was nonconformity to which a difference and a color gap of a tint take place by a gap of image spacing of a different color or the lap, and the quality of a color picture falls.
[0004] In order to prevent this kind of nonconformity, as a measuring method of the deflection of the above-mentioned scanning line, the method of turning to an imprint belt the reflective mold photosensor which consists of the light emitting device and photo detector to construct [two or more], arranging it, catching **** on an imprint belt by the photo detector, and measuring a gap of **** is well-known so that it may be indicated by JP,9-90695,A, for example.
[0005]
[Problem(s) to be Solved by the Invention] However, by the measuring method given [above-mentioned] in JP,9-90695,A, in order to distinguish and catch **** of that the light source which illuminates **** is needed, and four colors, each photo detector corresponding to a color is needed, and equipment serves as the cost high.
[0006] Then, this invention is equipped with the cheap means for measuring change of the scanning-line deflection of the laser beam bundle in each write-in means, and aims at offering the image formation equipment which can amend the difference and color gap of a tint by change of scanning-line deflection further.
[0007]
[Means for Solving the Problem] The image formation equipment of this invention which attains the above-mentioned object It has the photo conductor in which two or more revolutions are free, and two or more write-in means to perform a laser scan independently to each of the rotating photo conductor. At least this write-in

means The light source, It consists of an optical deflection means to deflect the laser beam bundle from this light source to a main scanning direction, and a lens for a scan which carries out image formation of the laser beam bundle to deflect to a photo conductor side. In the image formation equipment which piles up and imprints **** of each of this color on imprint material after developing the electrostatic latent image on each photo conductor formed of the laser scan of the write-in means of each above to corresponding **** of each color By leading the laser beam bundle scanned with each above-mentioned write-in means to a CCD sensor, it has a measurement means to measure the scanning-line deflection of each write-in means, and is characterized by **.

[0008] The above-mentioned measurement means can consider as the configuration which has a flux of light separation means to divide the laser beam bundle deflected with the above-mentioned optical deflection means into the 1st flux of light which carries out incidence to a photo conductor side, and the 2nd flux of light which carries out incidence to the above-mentioned CCD sensor. In this case, the above-mentioned flux of light separation means can make it the configuration which prepares a half mirror between the above-mentioned optical deflection means and a photo conductor side.

[0009] It can consider as the configuration which has arranged two or more CCD sensors along the migration locus top of the 2nd flux of light when the 1st flux of light of the above is deflected by the main scanning direction. Or it is good also as a configuration equipped with the migration means to which at least one CCD sensor is arranged to each write-in means, and this CCD sensor is moved along the migration locus top of the 2nd flux of light. moreover -- in this case -- each CCD sensor -- the optical axis of the 2nd flux of light of the above, and abbreviation -- the direction of a list of the pixel train in a vertical flat surface is easy to make it the 2nd migration locus, intersection, and configuration installed so that it might not intersect perpendicularly of the flux of light.

[0010] Furthermore, it can be made the configuration equipped with an amendment means to amend the deflection of the above-mentioned scanning line. In this case, this amendment means can be considered as the configuration whose adjustment of the amount of deflection of the scanning line which is made to carry out detailed migration of the optical axis of the laser beam bundle deflected with the above-mentioned optical deflection means in the direction of vertical scanning, and carries out image formation to the photo conductor of this laser beam bundle was enabled. Moreover, in this case, the above-mentioned amendment means has the transparence member equipped with the refracting interface which bends the laser beam bundle which it is installed between the above-mentioned optical deflection means and the above-mentioned lens for a scan, and is penetrated along the direction of vertical scanning, and can make it the configuration which adjusts the amount of deflection of the scanning line by leaning this transparence member.

[0011]

[Embodiment of the Invention] Hereafter, one example of this invention is explained based on a drawing. Drawing 1 is the outline block diagram of the image formation equipment of this example. The inside of this image formation equipment consists of the image read station 40, the image-processing section 50, and the printer section 60, and it is arranged at the printer section 60 so that 4 sets of imaging equipment constituted with the write-in means 20, the drum-like photo conductor 1, and the imaging components of the circumference of this photo conductor 1 may be located in a line on the imprint belt 2. The imaging equipment of these plurality shares black ("BK" shows below), cyanogen ("C" shows below), a Magenta ("M" shows below), and each color imaging process of yellow ("Y" shows below) sequentially from the drawing 1 Nakamigi hand. Here, the configuration and a series of imaging actuation of this equipment are outlined first.

[0012] With each imaging equipment, a full color image is obtained because each forms **** of four colors of BK, C, M, and Y and piles up and imprints **** of each color by which sequential formation is carried out to imprint material. For this reason, revolution actuation is carried out through driving roller 2a by driving roller 2a and follower roller 2b, and the driving source that it is laid [firmly] across 2c and illustrated, and the imprint belt 2 conveys the imprint material sent from the resist roller 3. In addition, although it is the configuration of piling up **** of four colors of BK, C, M, and Y, 1 set of recording devices are omitted among these 4 sets of recording devices, **** of three colors is piled up, and you may make it obtain a color picture in this example.

[0013] For example, with the recording device which forms C ****, photo conductor 1C is charged in homogeneity with the electrification means which revolution actuation is carried out with the drive which is not illustrated to the clockwise rotation in drawing 1 (it will be the direction of vertical scanning if it sees from

write-in means 20C), and consists of electrification charger 4C, and an electrostatic latent image is formed by exposure by write-in means 20C. Write-in means 20C carries out outgoing radiation of the laser beam by which carried out actuation control of the light source by the laser actuation control section with the digital picture signal of C from the image-processing section 50, and intensity modulation was carried out with the digital picture signal of C, deflects this laser beam bundle repeatedly to a main scanning direction (shaft orientations of a photo conductor 1) with the optical deflection means which consists of a polygon mirror 21, writes the information on C in photo conductor 1C as the scanning line, and forms an electrostatic latent image here. Like latent-image formation of Above C, moreover, in other recording devices Revolution actuation is carried out and photo conductor 1BK, and 4M and 4Y are charged in homogeneity by each electrification charger 4BK, and 4M and 4Y, respectively. An electrostatic latent image is written in by the exposure corresponding [BK / write-in means 20/ write-in means 20Y] to the image information of each color in write-in means 20M to photo conductor 1Y to photo conductor 1M to photo conductor 1BK.

[0014] Moreover, the outline of a means to measure the laser beam of the above-mentioned write-in means 20BK - 20Y is as follows. it is alike, respectively and CCD unit 22BK which consists of a CCD sensor, and 22C, 22M and 22Y are arranged at the write-in means 20BK - 20Y side of each above. And a part of laser beam bundle which faces to a photo conductor 1 is led to each CCD unit 22BK - 22Y from the inside of each write-in means 20BK-20Y. Each [these] write-in means 20 and each CCD sensor 22 are connected to the control section 51 which consists of arithmetic units, such as CPU.

[0015] The electrostatic latent image on photo conductor 1C is developed by the next of latent-image formation with 2 component developer which consists of 1 component developer or C toner which consists of a C toner by developer 5C as a development means, and a carrier, and becomes it with **** of C. like formation of this C ****, the electrostatic latent image on photo conductor 1BK, 1M, and 1Y is developed, respectively with the developer which contains BK toner, M toner, and Y toner by each, developer 5BK, and 5M and 5Y, and turns into **** of BK, M, and Y.

[0016] The imprint material which consists of a transfer paper P by the feed koro 7 is fed to the resist roller 3 from either of two sheet paper cassettes 6 with the above-mentioned image formation actuation. As the resist roller 3 takes timing with the image formation on each photo conductor 1, it sends out a transfer paper P to the imprint belt 2, and the imprint belt 2 conveys a transfer paper P in the heat fixing roller 9 direction. In case the transfer paper P on the imprint belt 2 passes the nip section of photo conductor 1BK, and 1C, 1M and 1Y, by imprint charger 8BK, and 8C, 8M and 8Y [the imprint belt 2, and] One by one, BK **** on photo conductor 1BK, C **** on photo conductor 1C, M **** on photo conductor 1M, and Y **** on photo conductor 1Y are imprinted, and a full color image is formed in a printing side. Then, it is fixed to a toner by the heat fixing roller 9, and a transfer paper P is discharged as a color copy with the delivery roller 10 outside.

[0017] Moreover, photo conductor 1BK, and 1C, 1M and 1Y are cleaned by cleaning equipment 11BK, and 11C, 11M and 11Y after a **** imprint, respectively, and a residual toner is removed. Moreover, cleaning equipment 12 cleans the imprint belt 2 after transfer paper conveyance.

[0018] Hereafter, the measurement means of the laser scan location of the above-mentioned image formation equipment and the amendment means of a laser scan location are explained to a detail.

[0019] Drawing 2 is drawing showing the configuration of the write-in means 20 circumference of drawing 1 , this drawing (a) is a sectional side elevation, and this drawing (b) is a top view. As shown in these drawings, through a collimate lens 24, aperture 25, a cylindrical lens 26, and soundproof glass 27, by the motor which is not illustrated, the laser beam bundle emitted from the light source which consists of semiconductor laser 23 reaches the polygon mirror 21 by which revolution actuation is carried out, and is deflected. The deflected laser beam bundle passes along soundproof glass 27 again, and attains it through the lenses 28a and 28b for a scan to the half mirror 29 which is a flux of light separation means.

[0020] As shown in drawing 2 (a), image formation of the 1st flux of light L which penetrated the half mirror 29 among the laser beam bundles which reached the half mirror 29 is carried out to photo conductor side 1a which is a scan layer-ed through protection-against-dust glass 32, it writes in the scanning line and, on the other hand, 2nd flux of light L' reflected by the half mirror 29 carries out incidence to the CCD unit 22.

[0021] As shown in drawing 2 (b), predetermined spacing is opened in a main scanning direction Y (the direction of image quantity), and three CCD units 22 are installed. That is, these CCD units 22 arrange in parallel line CCD22a as a light sensing portion on the scan locus of flux of light L' of the above 2nd accompanying the scan of the 1st flux of light L deflected by the polygon mirror 21. Incidence of the 2nd flux

of light L' deflected by the polygon mirror 21 will be carried out to three CCD units 22 one after another, and it will repeat this for every scan layer of the polygon mirror 21. In addition, some laser shaken among the 1st flux of light L to the end side of a main scanning direction Y carries out incidence to the synchronous sensor 31 through a mirror 30 by return.

[0022] In this example, a half mirror 29 is formed along a main scanning direction Y, and the flux of light from the polygon mirror 21 is mostly divided into a right angle. therefore, each line CCD22a -- a half mirror 29 -- it is attached so that predetermined distance alienation may be carried out in the width Z of vertical scanning, i.e., the direction, and it may be vertically turned immediately to it to laser beam bundle L' and it may rank with a main scanning direction X at equal intervals.

[0023] Moreover, the pixel train of each line CCD22a is in a vertical flat surface to the optical axis of 2nd flux of light L', and the direction of a list of this pixel is arranged in the direction of X in alignment with the optical axis of the 1st flux of light L. That is, the vertical-scanning location of the scanning line which the 1st flux of light L writes in photo conductor side 1a is relatively pinpointed by the pixel location of the direction of X as for which 2nd flux of light L' carries out image formation. Therefore, if the Mitsushige alignment of the direction of X on line CCD22a is measured, it will become a thing reflecting the vertical-scanning location of the scanning line in the image quantity. And each output of the CCD unit 22 prepared in three in a scan field is incorporated by the control section 51, the vertical-scanning location in each image quantity is pinpointed, and the deflection of the scanning line is measured.

[0024] Moreover, since measurement of the deflection of the scanning line is attained by leading a laser beam bundle to direct line CCD22a by the configuration using the above-mentioned half mirror 29, without establishing the special light source and it is measured at the process before developing every write-in means 20, the cheap photo detector for monochrome which consists of CCD is sufficient. Moreover, since the pixel is unified in the condition of having arranged at equal intervals, from the first, a CCD sensor is easy to arrange, and since the optical storage time is moreover electrically changed also about sensibility, it is easy [sensor] to adjust.

[0025] In addition, in this example, although two or more CCD units 22 are used to each write-in means 20, it can attach in the migration stage which does not illustrate one CCD unit 22, can be made to be able to move to a main scanning direction Y, and can measure also by investigating the pixel location through which flux of light L' passes in desired image quantity. In this case, the number of required sensors becomes fewer and it is advantageous to the cost reduction in this point.

[0026] Moreover, although this direction of a pixel train is not made in agreement as thoroughly as the direction of X although the direction of a pixel train of line CCD22a lies at right angles in the direction of Y in this example in accordance with the direction of X which can specify the scan location gap by photo conductor side 1a, but it is in XY flat surface rather and the direction of X is crossed, it is good to lean so that it may not intersect perpendicularly in the direction of Y. If it carries out like this, the effectiveness as having become fine that narrowing pixel spacing has the same pixel pitch to the direction Z of vertical scanning in photo conductor side 1a (it appears in the direction of X with Line CCD) will be acquired, and the accuracy of measurement of scanning-line deflection will improve.

[0027] Drawing 3 is the sectional view of the write-in means 20 equipped with the amendment means of scanning-line deflection. An amendment means here has the optical-axis migration means which the laser beam bundle before reaching to a half mirror 29 was made refracted, and made this optical-axis location adjustable, changes the direction height of vertical scanning of the laser beam bundle which carries out incidence of this optical-axis migration means to the lenses 28a and 28b for a scan by carrying out actuation control by the above-mentioned control section 51, and makes in agreement the amount of scanning-line deflection between each write-in means 20.

[0028] The above-mentioned optical-axis migration means in this example is the transparence member 31 of the rectangular section prepared before lens 28a for a scan. As for this transparence member 31, a longitudinal direction has parallel refracting interface 31a of abbreviation parallel of a front face and a rear face in accordance with a main scanning direction Y. The transparence member 31 can be freely rotated centering on the main scanning direction Y which passes near [this] the core, and, thereby, as for parallel refracting interface 31a, a front face and a rear face have a predetermined include angle to both opticals axis.

[0029] And since the laser beam bundle deflected by the above-mentioned polygon mirror 21 should pass soundproof glass 27, it passes the transparence member 31, and the direction Z of vertical scanning of a laser

beam shaft is moved to parallel by parallel refracting interface 31a before and after setting up with angle of rotation of the transparence member 31 at this time. Through the lenses 28a and 28b for a scan, eventually, on photo conductor side 1a, the laser beam bundle which carried out the parallel displacement serves as change of the amount of scanning-line deflection in the direction Z of vertical scanning, and appears to it.

[0030] On the other hand, the amount of deflection of the scanning line is calculated by the control section 51 from the output of the above-mentioned line CCD22a, as mentioned above, and the amount of system deviation is obtained by the comparison between the value (theoretical value) of the normal of a scanning-line location, or each write-in means 20 here. This is converted into the amount of angle of rotation as a control input required for the transparence member 31, and actuation control of the transparence member 31 is carried out by this. Thus, by controlling angle of rotation of the transparence member 31, and arranging the deflection of each scanning line through two refracting interface 31a approximately [this] so that the scan location scaled in each CCD unit 22 may be in agreement between each write-in means 20, a color gap etc. can be amended and the quality of an image can be raised.

[0031] In addition, the transparence member 31 which consists of the above-mentioned parallel plate etc. needs to cover all image quantities. The transparence member 31 in connection with this invention is installed between the polygon mirror 21 and lens 28a for a scan, its magnitude of the transparence member 31 needed in the direction of image quantity as compared with the case where it installs between the lens 28 for a scan and photo conductor side 1a is small, it can be managed with this point, and is advantageous to that part cost reduction.

[0032]

[Effect of the Invention] As explained above, the image formation equipment of this invention Since it is the configuration equipped with a measurement means to measure the scanning-line deflection of each write-in means by leading the laser beam bundle scanned with each write-in means to a CCD sensor In order not to degrade the quality of the image which can measure comparatively cheaply and easily the deflection of the scanning line for every write-in means, piles up each image by this, imprints, and is obtained by the above-mentioned CCD sensor, it can know it is necessary how many deflection of the scanning line of which write-in means to amend.

[0033] According to the configuration which has the flux of light separation means which the above-mentioned measurement means divides into the 1st flux of light which carries out incidence of the laser beam bundle deflected with the above-mentioned optical deflection means to a photo conductor side, and the 2nd flux of light which carries out incidence to the above-mentioned CCD sensor, each write-in means can measure the deflection of the scanning line with this flux of light separation means with the condition in which image formation is possible.

[0034] According to the configuration which has arranged two or more CCD sensors along the migration locus top of the 2nd flux of light when the 1st flux of light of the above is deflected by the main scanning direction, since these two or more CCD sensors are arranged in a main scanning direction, scanning-line deflection can be measured by the easy device with little moving part.

[0035] At least one CCD sensor is arranged to each write-in means, and according to the configuration equipped with the migration means to which this CCD sensor is moved along the migration locus top of the 2nd flux of light, since it is one CCD sensor required for each write-in means, cost can be reduced from the case where two or more these is prepared.

[0036] the above-mentioned CCD sensor -- the optical axis of the 2nd flux of light of the above, and abbreviation -- since the resolution of measurement of a narrowing line CCD becomes [the pixel row pitch in the direction which pinpoints the vertical-scanning location of the above-mentioned migration locus] high, according to the 2nd migration locus, intersection, and configuration that were installed so that it may not intersect perpendicularly of the flux of light in the direction of the pixel train in a vertical flat surface of a list, the accuracy of measurement improves from the case intersect perpendicularly with the direction of the 2nd flux of light of the above of a migration locus.

[0037] Furthermore, according to the configuration equipped with an amendment means to amend the deflection of the above-mentioned scanning line, it piles up by amending the deflection of the scanning line produced with each write-in means, and quality degradation of the color gap in a transfer picture etc. can be suppressed.

[Translation done.]